

What is claimed is:

1 1. A method for mounting an optical subassembly of an
2 optical reading device to an image sensor subassembly of an
3 optical device, said method comprising the steps of:
4 moving said optical subassembly and said image sensor
5 subassembly in proximity with one another; and
6 soldering said optical and image sensor assemblies
7 together using a solder material, wherein immediately prior to
8 said soldering step there is no contact between said optical
9 subassembly and said image sensor subassembly that prevents
10 free movement of said optical subassembly and said image
11 sensor subassembly in either of the x or y directions.

1 2. The method of claim 1, further comprising the step of
2 forming a solderable surface on at least one of said optical
3 subassemblies or said image sensor subassemblies.

1 3. The method of claim 1, further comprising the step of
2 forming a solderable surface on at least one of said optical
3 subassemblies or said image sensor subassemblies, wherein said
4 forming step includes the step of overmolding non-solderable
5 material onto solderable material to form said solderable
6 surface.

1 4. The method of claim 1, further comprising the step of
2 forming a solderable surface on at least one of said optical
3 or image sensor subassemblies, wherein said forming step
4 includes the step of plating a solderable material onto a non-
5 solderable material.

1 5. The method of claim 1, further comprising the step of
2 forming a solderable material on at least one of said optical
3 or image sensor subassemblies, wherein said forming step
4 includes the step of insert molding solderable material in
5 non-solderable material.

1 6. The method of claim 1, further comprising the step of
2 forming a solderable surface on said optical subassembly,
3 wherein said forming step includes the step of making a frame
4 for said optical subassembly comprising essentially solderable
5 material.

1 7. The method of claim 1, further comprising the step of
2 forming a solderable surface on at least one of said optical
3 subassemblies or said image sensor subassemblies, wherein said
4 forming step includes the step of making said solderable
5 surface in an irregular configuration having an increased
6 surface area per unit three dimensional space relative to that
7 of a smooth surface.

1 8. The method of claim 7, wherein said at least one
2 solderable surface is in the configuration of a pin.

1 9. The method of claim 8, wherein said pin comprises a
2 substantially uniform-diameter.

1 10. The method of claim 7, when said at least one
2 solderable surface is in the configuration of a threaded
3 screw.

1 11. The method of claim 7, wherein said at least one
2 solderable surface is in the configuration of a hole.

1 12. The method of claim 11, wherein said hole is a
2 through-hole.

1 13. The method of claim 1, further comprising the step
2 of forming a first solderable surface on one of said
3 subassemblies and a second solderable surface in said other of
4 said subassemblies, wherein said first solderable surface is
5 in made in the configuration of a pin driving a substantially
6 uniform-diametered body, and said second solderable surface is
7 made in the configuration of a through-hole, wherein said pin
8 body has a diameter smaller than said hole to allow positional
9 adjusting of said optical subassembly relative to said image
10 sensor subassembly.

1 14. The method of claim 1, further comprising the steps
2 of forming a solderable pin on one of said subassemblies, and
3 making a hole for receiving said pin on the remaining of said
4 subassemblies.

1 15. The method of claim 1, wherein said method further
2 comprises the step, after said moving step, of aligning said
3 optical subassembly and image sensor subassembly using a video
4 monitor which displays an output indicative of an output of
5 said image sensor.

1 16. The method of claim 1, wherein there is further no
2 contact between said subassemblies which prevents free
3 relative movement between said assemblies in a z-direction.

1 17. A method for mounting an optical subassembly to an
2 image sensor subassembly, said method comprising the steps of:
3 forming at least one solderable surface on at least one
4 of said optical and image sensor subassemblies;
5 moving said optical subassembly in proximity with said
6 image sensor subassembly to define an interface delimited by
7 said at least one solderable surface of said optical
8 subassembly or said image sensor subassembly; and
9 soldering said optical subassembly and said image sensor
10 subassembly together at said interface, wherein said optical
11 subassembly and said image sensor subassembly are configured
12 so that said image sensor subassembly and said optical
13 subassembly can be moved freely relative to one another in at
14 least either of an x or y direction immediately prior to said
15 soldering step.

1 18. The method of claim 17, wherein said forming step
2 includes the step of overmolding non-solderable material onto
3 solderable material.

1 19. The method of claim 17, wherein said forming step
2 includes the step of plating a solderable material onto non-
3 solderable material.

1 20. The method of claim 17, wherein said forming step
2 includes the step of insert molding solderable material in
3 non-solderable material.

1 21. The method of claim 17, wherein said forming step
2 includes the step of making a frame for said optical
3 subassembly comprising essentially solderable material.

1 22. The method of claim 17, wherein said forming step
2 includes the step of making said solderable surface in an
3 irregular configuration having an increased surface area per
4 unit three dimensional space relative to that of a smooth
5 surface.

1 23. The method of claim 22, wherein said at least one
2 solderable surface is in the configuration of a pin.

1 24. The method of claim 23, wherein said pin is of a
2 substantially uniform-diameter.

1 25. The method of claim 22, wherein said at least one
2 solderable surface is provided by a threaded screw.

1 26. The method of claim 22, wherein said at least one
2 solderable surface is in the configuration of a hole.

1 27. The method of claim 26, wherein said hole is a
2 through-hole.

1 28. The method of claim 17, wherein said forming step
2 includes the step of making a first solderable surface in one
3 of said subassemblies and a second solderable surface in said
4 other of said subassemblies, wherein said first solderable
5 surface is in made in the configuration of a pin having a
6 substantially uniform-diametered body, and a said second
7 solderable surface is made in the configuration of a through-
8 hole having a diameter larger than said pin body.

1 29. The method of Claim 17, when said forming step
2 includes the steps of forming a solderable pin on one of said
3 subassemblies and a hole for receiving said pin on said other
4 of said subassemblies.

1 30. The method of claim 17, wherein said moving step
2 includes the step of aligning optical elements of said optical
3 assembly with imaging elements of said image sensor assembly.

1 31. The method of claim 17, wherein said aligning step
2 includes the steps of:
3 exposing said image sensor assembly to a predetermined
4 test target; and
5 observing indicia representing electrical signals
6 generated by said image sensor.

1 32. The method of claim 17, wherein said subassemblies
2 are further configured to be freely moved in the z-direction
3 immediately prior to said soldering step.

1 33. An image sensor subassembly comprising:
2 a substantially rigid member;
3 an image sensor chip disposed on said substantially rigid
4 member; and
5 a solderable surface formed on said substantially rigid
6 member, said solderable surface being of a configuration
7 selected from the group consisting of a through-hole, a pin
8 having a substantially uniform-diametered body, or a threaded
9 screw.

1 34. The image sensor subassembly of claim 33, wherein
2 said solderable surface is made in an irregular configuration
3 having an increased surface area per unit three dimensional
4 space relative a smooth surface.

1 35. The image sensor subassembly of claim 33, wherein
2 said solderable surface is in the configuration of a
3 substantially uniform-diametered pin.

1 36. The image sensor subassembly of claim 33, wherein
2 said solderable surface is in the configuration of a pin
3 having a substantially uniform-diametered body.

1 37. The image sensor subassembly of claim 33, wherein
2 said solderable surface is provided by a threaded screw.

1 38. The image sensor subassembly of claim 33, wherein
2 said at least one solderable surfaces includes four solderable
3 surfaces formed about a periphery of said image sensor.

1 39. An optical subassembly comprising:
2 a substantially rigid member;
3 an optical element disposed on said substantially rigid
4 member; and
5 a solderable surface formed on said substantially rigid
6 member, said solderable surface being of a configuration
7 selected from the group consisting of a through-hole, a pin
8 having a substantially uniform-diametered body, or threaded
9 screw.

1 40. The optical subassembly of claim 39, wherein said
2 solderable surface is made in an irregular configuration
3 having an increased surface area per unit three dimensional
4 space relative to that of a smooth surface.

1 41. The optical subassembly of claim 39, wherein said
2 solderable surface is made in the configuration a through-
3 hole.

1 42. The optical subassembly of claim 39, wherein said
2 solderable surface is in the configuration of a pin having a
3 substantially uniform-diameter body.

1 43. The optical subassembly of claim 40, wherein said
2 solderable surface is provided by a threaded screw.

1 44. The optical subassembly of claim 40, wherein said at
2 least one solderable surfaces includes four solderable
3 surfaces formed about a periphery of said image sensor.

1 45. A method for making an optical and image sensor
2 assembly, said optical and image sensor assembly comprising an
3 optical image sensor subassembly and an image sensor
4 subassembly, said method comprising the steps of:
5 aligning said optical subassembly and said image sensor
6 subassembly relative to one another without substantially
7 benching said optical subassembly and said image sensor
8 subassembly against one another in either of the x direction
9 or y direction; and

10 when said optical subassembly and said image sensor
11 assembly are properly aligned, securing said optical
12 subassembly and said image sensor subassembly together.

1 46. The method of claim 45, further comprising the step
2 of forming a solderable surface on at least one of said
3 optical subassemblies or said image sensor subassemblies, and
4 wherein said securing step includes the step of soldering said
5 optical subassembly and said image sensor subassembly together
6 using a solder material.

1 47. The method of claim 45, further comprising the step
2 of forming a solderable surface on at least one of said
3 optical subassemblies or said image sensor subassemblies,
4 wherein said forming step includes the step of overmolding
5 non-solderable material onto solderable material to form said
6 solderable surface, and wherein said securing step includes
7 the step of soldering said optical subassembly and said image
8 sensor subassembly together using a solder material.

1 48. The method of claim 45, further comprising the step
2 of forming a solderable surface on at least one of said
3 optical or image sensor subassemblies, wherein said forming
4 step includes the step of plating a solderable material onto a
5 non-solderable material, and wherein said securing step
6 includes the step of soldering said optical subassembly and
7 said image sensor subassembly together using a solder
8 material.

1 49. The method of claim 45, further comprising the step
2 of forming a solderable material on at least one of said

3 optical or image sensor subassemblies, wherein said forming
4 step includes the step of insert molding solderable material
5 in non-solderable material, and wherein said securing step
6 includes the step of soldering said optical subassembly and
7 said image sensor subassembly together using a solder
8 material.

1 50. The method of claim 45, further comprising the step
2 of forming a solderable surface on said optical subassembly,
3 wherein said forming step includes the step of making a frame
4 for said optical subassembly comprising essentially solderable
5 material, and wherein said securing step includes the step of
6 soldering said optical subassembly and said image sensor
7 subassembly together using a solder material.

1 51. The method of claim 45, further comprising the step
2 of forming a solderable surface on at least one of said
3 optical subassemblies or said image sensor subassemblies,
4 wherein said forming step includes the step of making said
5 solderable surface in an irregular configuration having an
6 increased surface area per unit three dimensional space
7 relative to that of a smooth surface, and wherein said
8 securing step includes the step of soldering said optical
9 subassembly and said image sensor subassembly together using a
10 solder material.

1 52. The method of claim 51, wherein said pin has a
2 substantially uniform-diameter body.

1 53. The method of claim 51, wherein said at least one
2 solderable surface is in the configuration of a pin.

1 54. The method of claim 51, when said at least one
2 solderable surface is in the configuration of a threaded
3 screw.

1 55. The method of claim 51, wherein said at least one
2 solderable surface is in the configuration of a hole.

1 56. The method of claim 55, wherein said hole is a
2 through-hole.

1 57. The method of claim 45, further comprising the step
2 of forming a first solderable surface on one of said
3 subassemblies and a second solderable surface in said other of
4 said subassemblies, wherein said first solderable surface is
5 in made in the configuration of a pin, and said second
6 solderable surface is made in the configuration of a hole,
7 wherein said pin has a diameter smaller than said hole to
8 allow positional adjusting of said optical subassembly
9 relative to said image sensor subassembly, and wherein said
10 securing step includes the step of soldering said optical
11 subassembly and said image sensor subassembly together using a
12 solder material.

1 58. The method of claim 45, further comprising the steps
2 of forming a solderable pin on one of said subassemblies, and
3 making a hole for receiving said pin on the remaining of said
4 subassemblies, and wherein said securing step includes the
5 step of soldering said optical subassembly and said image
6 sensor subassembly together using a solder material.

1 59. The method of claim 45, further comprising the step
2 of aligning said subassemblies using a video monitor which
3 displays an output indicative of an output of said image
4 sensor.

1 60. The method of claim 45, wherein said aligning step
2 further includes the step of moving said subassemblies without
3 contact in a manner that prevents free movement of said
4 subassemblies in a z-direction.

1 61. An imaging device comprising:
2 an image sensor subassembly including an image sensor
3 mounted on a printed circuit board;
4 an optical subassembly, said optical subassembly
5 including an optical element disposed on a substantially rigid
6 member;
7 at least one solderable surface formed on either of said
8 printed circuit board or said optical subassembly defining at
9 least one solder receiving interface between said printed
10 circuit board and said optical subassembly; and
11 solder material for bonding said subassemblies disposed
12 at said at least one solder-receiving interface.

1 62. The device of claim 61, further including a housing
2 encapsulating said device, said device partially defining a
3 feed path.

1 63. The device of claim 61, further including a housing
2 encapsulating said device, said housing including a handle.

1 64. The device of claim 61, wherein said at least one
2 solderable surface is made in an irregular configuration
3 having an increased surface area per unit three dimensional
4 space relative to that of a smooth surface.

1 65. The device of claim 61, wherein said at least one
2 solderable surface is made in the configuration of a hole.

1 66. The method of claim 65, wherein a hole is a through-
2 hole.

1 67. The device of claim 61, wherein said at least one
2 solderable surface is in the configuration of a pin.

1 68. The method of claim 67, wherein said pin comprises a
2 substantially uniform-diameter body.

1 69. The device of claim 61, wherein said at least one
2 solderable surface is provided by a threaded screw.

1 70. An imaging device comprising:
2 an image sensor subassembly including an image sensor
3 mounted on a printed circuit board;
4 an optical subassembly, said optical subassembly having a
5 single receive optical axis and including an optical element
6 disposed on a substantially rigid member;
7 at least one solderable surface formed on either of said
8 image sensor subassembly or optical subassembly defining at
9 least one solder receiving interface between said image sensor
10 subassembly and said optical subassembly; and

11 solder material for bonding said subassemblies disposed
12 at said at least one solder-receiving interface.

1 71. The device of claim 70, further comprises a housing
2 encapsulating said device said housing partially defining a
3 feed path for receiving documents.

1 72. The device of claim 70, further comprising a housing
2 encapsulating said device said housing including a handle.

1 73. The device of claim 70, wherein said at least one
2 solderable surface is made in an irregular configuration
3 having an increased surface area per unit three dimensional
4 space relative to that of a smooth surface.

1 74. The device of claim 70, wherein said at least one
2 solderable surface is made in the configuration of a hole.

1 75. The device of claim 74, wherein said hole is
2 through-hole.

1 76. The device of claim 75, wherein said at least one
2 solderable surface is in the configuration of a pin.

1 77. The device of claim 76, wherein said pin has
2 substantially uniform-diametered body.

1 78. The device of claim 70, wherein said at least one
2 solderable surface is provided by a threaded screw.

1 79. An optical reading device comprising:
2 an optical and image sensor assembly including
3 an image sensor subassembly including an image sensor
4 mounted on a substantially rigid planar member,
5 an optical subassembly, said optical subassembly
6 including an optical element disposed on a substantially rigid
7 member,
8 at least one solderable surface formed on either of said
9 optical subassembly or said substantially rigid planar member
10 defining at least one solder receiving interface between said
11 substantially rigid planar member and said optical
12 subassembly,
13 solder material for bonding said subassemblies disposed
14 at said at least one solder-receiving interface,
15 a housing, said optical and image sensor assembly being
16 disposed in said housing.

1 80. The device of claim 79, wherein said housing
2 partially defines a feed path and wherein said device is a
3 document reading device, for reading indicia from documents
4 transported along said feed path.

1 81. The device of claim 79, wherein said housing
2 includes a handle, and wherein said device is a hand held
3 optical reader.

1 82. The device of claim 79, wherein said at least one
2 solderable surface is made in an irregular configuration
3 having an increased surface area per unit three dimensional
4 space relative to that of a smooth surface.

1 83. The device of claim 79, wherein said at least one
2 solderable surface is made in the configuration of a hole.

1 84. The device of claim 83, wherein said hole is a
2 through-hole.

1 85. The device of claim 79, wherein said at least one
2 solderable surface is in the configuration of a pin.

1 86. The device of claim 85, wherein said pin comprises a
2 substantially uniform-diametered body.

1 87. The device of claim 79, wherein said at least one
2 solderable surface is provided by a threaded screw.

1 88. A method for mounting an optical subassembly of an
2 optical reading or imaging device to an image sensor
3 subassembly of an optical reading or imaging device, said
4 method comprising the steps of:
5 moving said optical subassembly and said image sensor
6 subassembly in proximity with one another;
7 aligning said optical subassembly with said image sensor
8 subassembly; and
9 without a component part of said image sensor subassembly
10 being in contact with a component part of said optical
11 subassembly, soldering said optical and image sensor
12 assemblies together using a solder material.

1 89. The method of claim 88, further comprising the step
2 of forming a solderable surface on at least one of said
3 optical subassemblies or said image sensor subassemblies.

1 90. The method of claim 88, further comprising the step
2 of forming a solderable surface on at least one of said
3 optical subassemblies or said image sensor subassemblies,
4 wherein said forming step includes the step of overmolding
5 non-solderable material onto solderable material to form said
6 solderable surface.

1 91. The method of claim 88, further comprising the step
2 of forming a solderable surface on at least one of said
3 optical or image sensor subassemblies, wherein said forming
4 step includes the step of plating a solderable material onto a
5 non-solderable material.

1 92. The method of claim 88, further comprising the step
2 of forming a solderable material on at least one of said
3 optical or image sensor subassemblies, wherein said forming
4 step includes the step of insert molding solderable material
5 in non-solderable material.

1 93. The method of claim 88, further comprising the step
2 of forming a solderable surface on said optical subassembly,
3 wherein said forming step includes the step of making a frame
4 for said optical subassembly comprising essentially solderable
5 material.

1 94. The method of claim 88, further comprising the step
2 of forming a solderable surface on at least one of said
3 optical subassemblies or said image sensor subassemblies,
4 wherein said forming step includes the step of making said
5 solderable surface in an irregular configuration having an

6 increased surface area per unit three dimensional space
7 relative to that of a smooth surface.

1 95. The method of claim 94, wherein said at least one
2 solderable surface is in the configuration of a pin.

1 96. The method of claim 94, wherein said at least one
2 solderable surface is in the configuration of a pin having a
3 substantially uniform-diametered body.

1 97. The method of claim 88, when said at least one
2 solderable surface is in the configuration of a threaded
3 screw.

1 98. The method of claim 94, wherein said at least one
2 solderable surface is in the configuration of a hole.

1 99. The method of claim 94, wherein said at least one
2 solderable surface is in the configuration of a through-hole.

1 100. The method of claim 91, further comprising the step
2 of forming a first solderable surface on one of said
3 subassemblies and a second solderable surface in said other of
4 said subassemblies, wherein said first solderable surface is
5 in made in the configuration of a pin having a substantially
6 uniform-diametered body, and said second solderable surface is
7 made in the configuration of a through-hole, wherein said pin
8 body has a diameter smaller than said through-hole to allow
9 positional adjusting of said optical subassembly relative to
10 said image sensor subassembly.

1 101. The method of claim 91, further comprising the
2 steps of forming a solderable pin on one of said
3 subassemblies, and making a through-hole for receiving said
4 pin on the remaining of said subassemblies.